William Keith Brooks.

William Keith Brooks was born at Cleveland, O., March 25, 1848, and died at his home, "Brightside," near Baltimore, November 12, 1908. His parents were born in Vermont, but their ancestors had lived for many generations at or near Concord, Mass., the first of the name having come to America from England prior to 1634. Young Brooks received his early education in the public schools of Cleveland, and he afterward entered Hobart College, Geneva, N. Y., where, he says, "I learned to study, and, I hope, to profit by but not to blindly follow, the writings of that great thinker on the principles of science, George Berkeley." He spent two years at Hobart, where he took high honors, and then entered the junior class at Williams College. Here he distinguished himself as a thorough and independent scholar, and is said to have been one of the most brilliant students in mathematics Williams had ever known. In 1870 he received the degree of bachelor of arts and was elected to Phi Beta Kappa.

After his graduation his father took him into mercantile business with himself, intending that he should become his successor, but such work was distasteful to young Brooks and he soon abandoned it and became a teacher in a boys school at Niagara, N. Y. When he left college he was undecided whether to devote himself to mathematics, to Greek, or to biology, for he was unusually proficient in all of these subjects. He was an enthusiastic naturalist; even as a boy he had given much attention to fresh-water aquaria and to the habits of animals, and he had published some of his observations; with one of his friends he had constructed a microscope and with other associates he had organized a class in natural history; he had also read many books on natural history and was intensely interested in evolution and Darwinism. He finally decided to devote himself to biology, largely influenced, we may imagine, by the philosophical importance of this subject.

At Harvard Louis Agassiz was at the climax of his wonderful career, and thither flocked many young men, who afterward became leaders in biological science, to study under this great master; among these was Brooks. In the summer of 1873 he was a student at Agassiz's laboratory at Penikese, and from that time until his death he remained a student of marine life. The sea with its teeming multitudes of living things always had a particular charm for him, not merely because of the interest and variety of its forms of life, but also because it was the scene of the earliest acts in the drama of evolution.

In 1875 he received the degree of Ph.D. from Harvard University and was appointed assistant in the museum of the Boston Society of Natural History. On the founding of the Johns Hopkins University in 1876 Brooks applied for and obtained one of their twenty famous fellowships, which have done so much to change the character of university work and ideals in this country. Before he entered upon his fellowship his abilities as a teacher were recognized and he was appointed associate in biology. In 1883 he was appointed associate professor of morphology and in 1889 professor in that subject. On the retirement of Professor H. Newell Martin from the headship of the Biological Department in 1894, Professor Brooks became head of the department and continued in that position until his death. His active scientific life was therefore coextensive with that of the Johns Hopkins University, and his love of the Biological Department and his loyalty to his University were among his strong characteristics.

Although his publications were numerous and important I think that his influence was greatest and most far reaching in his work as a teacher and scientific director. To few biologists, perhaps to no other in the history of this country, has it been given to direct the work and shape the scientific ideals of so large and influential a body of young men. Among those who took their doctor's degrees under him are more than a score of the leading zoölogists of this country, while many other distinguished scholars of this and foreign lands were his pupils.

Although Professor Brooks would present a subject in his lectures in a most clear and entertaining manner, he rarely if ever

attempted to smooth the path of the investigator; the latter was to a very large extent thrown upon his own resources. He believed so thoroughly in the law of natural selection, as he once told me, that he thought it was best for a student to find out for himself, as soon as possible, whether he was fitted for independent investigation or not, and by this rigid discipline the unfit were weeded out from the fit. This was certainly no school for weaklings, but it afforded magnificent training for those who had ability and determination. For those who endured this ordeal he maintained the warmest regard, and his interest and pride in the work of his students was as marked as it was stimulating.

In connection with his work as teacher and director must be mentioned the establishment by him of the Chesapeake Zoological Laboratory in 1878. This was the second marine laboratory in this country founded for advanced work in pure zoölogy. The first was established by Louis Agassiz on the island of Penikese in Buzzards Bay in 1871. The Chesapeake Laboratory, unlike the one at Penikese, was not limited to one place, it consisted neither of buildings nor equipment, but of men and ideas. For the first few years of its existence it was located at several different points in Chesapeake Bay; afterwards it was located at Beaufort, N. C., then at different places in the Bahama Islands, and finally in Jamaica. In the various expeditions of Brooks and his students to these different places they made not only a thorough biological survey of each region, but they did work of most fundamental and far reaching importance on the various groups of animals found. Out of these expeditions has grown the beautiful and permanent station of the U. S. Fisheries Bureau at Beaufort, N. C., in which Brooks took great interest and pride.

The "Scientific Results of the Sessions of the Chesapeake Zoölogical Laboratory" were at first published as a separate journal of which Brooks was the founder and editor, later this was incorporated in the "Studies from the Biological Laboratory" of which he was joint editor with H. Newell Martin. He subsequently established and edited "Memoirs from the Biological Laboratory," a large quarto for the publication of important monographs. He

was also one of the editors of the "Journal of Experimental Zoölogy."

As a scientific investigator Brooks showed sound judgment, depth of insight, and untiring industry and enthusiasm. In his research he did not attempt to cover the whole field of zoölogy, but he did attempt to do thoroughly and well all that he undertook. His work began at a time when descriptive embryology was the newest and most promising branch of zoology and much of his earlier work was devoted to this field. His first important paper was on the "Development of *Salpa*," and many of his later works, some of them monumental monographs, were devoted to the anatomy, embryology and evolution of this interesting group of ascidians. Indeed his latest work which was left in manuscript and for which he had prepared hundreds of beautiful drawings, was a continuation of his great "Monograph on the Genus *Salpa*." Among other important researches may be mentioned his studies on the "Lucayan Indians," "Development of Marine Prosobranchiate Gasteropods," "Early Stages in the Development of Fresh Water Pulminates," "The Development of Lingula and the Systematic Position of the Brachiopoda," "The Relationships of Mollusca and Molluscoidea," "The Life History of the Hydromedusæ," "The Stomatopoda of the Challenger Expedition," "Lucifer: A Study in Morphology," "The Embryology and Metamorphosis of the Macroura" (with F. H. Herrick), and a "Monograph of the Genus *Doliolum*."

His studies on the development of mollusks led him to an examination of the life history and habits of the oyster and this was followed by a consideration of the best methods of propagating and cultivating oysters. His work on this subject was embodied in a book called "The Oyster," which has recently appeared in a second edition. Because of its economic importance, Brooks has been more widely known through this work than through any other. He was made chairman of the Maryland Oyster Commission and did much to improve this industry by a scientific treatment of the subject.

He wrote but one text-book, his "Handbook of Invertebrate Zoölogy" (1882) but this was so excellent that it still remains a model, and in some respects has not been excelled, if equalled, by any later book on that subject.

His chief interest was always in the philosophical side of biology and into this he put the larger part of his life work. Even the special researches, some of which have been named above, were permeated by philosophical inquiry, and most of his books and later contributions were devoted to the deeper philosophical meanings of vital phenomena.

As a boy he had read the works of Darwin and had been immensely impressed by them and to the last he yielded to no one in his admiration and reverence for that great master. Probably no other disciple of Darwin was more thoroughly acquainted with his works, and very frequently when criticisms of Darwinism appeared he would point out the fact that the critic did not understand what Darwinism is, or that Darwin had already met and answered the objections raised.

In 1884 he published a book entitled "The Law of Heredity," which in some respects anticipated the theories of Weismann, and which won the highest commendation from Huxley and other leaders of biology. But probably the book by which he will be longest remembered is the series of lectures delivered at Columbia University and published in the Biological Series of that institution under the title "The Foundations of Zoölogy" (1899). In this book he deals with many subjects fundamental not only to zoölogy, but to science and philosophy in general. Among these may be mentioned "Nature and Nurture," "Zoölogy and the Philosophy of Evolution," "Natural Selection and the Antiquity of Life," "Natural Selection and Natural Theology," "Paley and the Argument from Contrivance," "The Mechanism of Nature," "Louis Agassiz and George Berkeley," etc. On the whole his chief points of view may be summarized in his oft-quoted remark of Aristotle that the "essence of a living thing is not what it is made of nor what it does, but why it does it," or as he expresses it elsewhere, "the essence of a living thing is not protoplasm but purpose"; and in the further statements which he draws from Berkeley, that "nature is a language," that "phenomena are appearances," and that "natural laws are not arbitrary nor necessary, but natural, *i. e.*, neither less nor more than one who has the data has every reason to expect."

On March 25, 1898, sixty of his former students united in pre-

senting to him an oil portrait of himself together with a congratulatory address, and at the end of his book on the "Foundations of Zoölogy," he added on this date, the following note:

"For you who have, at this time, for my encouragement, called yourselves my students, I have written this book which has been my own so long that I should part with it with regret, did I not hope that, as you study the great works to which I have directed you, you may still call me teacher. . . . If you are indeed my students, you are not afraid of hard work, so in this day of light literature, when even learning must be made easy, you must be my readers, and you must do double duty; for I take the liberty of a teacher with his pupils, and ask that, after you have read the book, you will some day read it again; since I hope that what may seem obscure, may, on review, be found consistent and intelligible."

David Starr Jordan review this book in *Science* under the caption "A sage in biology." Whatever one may be inclined to say of his conclusions and theories, it cannot be denied that in an age when biological investigators have been content with discovering phenomena, he has attempted to go back of phenomena to their real meaning and significance and to point out the relationship of these newly discovered phenomena to the great current of philosophy which has flowed down to us from the remote past.

In his philosophical writing he was most deeply influenced by Aristotle, Berkeley and Huxley. Much that he has written still seems to me obscure, although I have read it more than once, but I bear in mind his parting request, and in the meantime profit by that which I do understand and am charmed by the classical and almost poetical diction in which it is written.

His abilities received early and generous recognition. Apart from his university advancement he received many honors. He received the honorary degree of LL.D. from Williams College in 1893, from Hobart College in 1899, and from the University of Pennsylvania at the Franklin Bicentennary in 1906. In 1884, at the age of thirty-six, he was elected a member of the National Academy of Sciences; he was chosen a member of the American Philosophical Society in 1886; of the Academy of Natural Sciences of Philadelphia in 1887; he was also a member of the Boston Society of Natural History, the American Academy of Arts and Sciences, of the Maryland Academy of Arts and Sciences, and of

the American Society of Zoölogists; he was a fellow of the American Association for the Advancement of Science, and also a fellow of the Royal Microscopical Society. For his work on the oyster he received the medal of the Société d'Acclimatation of Paris; for his work on the scientific results of the Challenger Expedition he was given a Challenger Medal; and he received a medal at the St. Louis Exposition of 1904, where he gave an address. He was Lowell Lecturer in Boston in 1901, and he gave one of the principal addresses before the International Zoölogical Congress in 1907.

These honors he highly prized, and perhaps none of them more than his membership in this society. Whenever he was able, he attended the general meetings of the society, and usually presented a paper on some philosophical subject. He served as a counsellor of the society and frequently spoke to me of its purposes and policies. He greatly enjoyed coming into this historic hall, rich in its associations with great men of the past, and on one occasion when I spoke to him of the plan to provide a larger home for the society in a more central part of the city, he said to me, "Do you think you have any right to move the home of the society? It seems to me that you are only trustees of a historic institution, executors of an ancient trust, and that you have no right to remove this monument from its historic site."

In personal character Professor Brooks was simple and child-like, unconventional in manners, dress and speech. With him talking meant expressing ideas, not merely passing the time, and if he had no answer ready when a question was asked him, he usually gave no answer until he was ready. These characteristics made him appear somewhat unique and picturesque, and gave rise to many charming anecdotes about him which his students and friends relate with merriment, but real affection. He was kind and gentle; and neither in his publications nor in his relations with his students did he ever deal in scorn, irony, nor invective. President Remsen said of him that he had been called the most lovable man in the faculty. His interest in his former students was genuine and hearty though he rarely expressed it directly to the person concerned. He was modest and dignified; sincerity itself; loyal to his friends, his university, and his ideals; independent in thought and action, and

not easily moved from a position he had once taken. He was a man of wide culture; he loved the best literature, music and art. When I last saw him at his home we spent the entire evening until after midnight playing, on his automatic piano, great compositions of Beethoven, Mozart, Wagner and other masters of harmony.

In his home life he was most happy and devoted. He married in June, 1878, Amelia Schultz, of Baltimore, by whom he had two children, Chas. E. Brooks, Ph.D., of Elizabeth, N. J., and Menetta W. Brooks, A.B., who, after the death of Mrs. Brooks in 1901, took charge of his home.

Professor Brooks once told me that he proposed to retire from his professorship when he had reached the age of sixty and thereafter devote himself entirely to philosophical and scientific work. He reached the age of sixty last March, but how different was his realization from his plan. His retirement was not to the scholarly leisure for which he longed, but to pain, weakness and mortal sickness. For nine months he struggled against a complication of organic heart trouble and kidney disease and at sunrise on Thursday, November twelfth, he breathed his last.

In his death this society has lost a worthy and devoted member, the world of scholars a man of rare ability and accomplishments, and his friends and associates a noble and lovable companion. Peace to his ashes, honor and reverence to his memory!

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